Testimony Regarding House Bill 4875, 2011
Committee on Natural Resources, Tourism and Outdoor Recreation
September 20, 2011

Presenter Background

CTI and Associates, Inc. has developed, in conjunction with St. Clair County, a septage bioreactor landfill technology currently in use as a Research, Demonstration and Development (RDDP) project at the Smiths Creek Landfill

Terri Zick, Director of Compliance Services, has been with CTI since 2002 and has 25 years experience in regulatory compliance and environmental management at solid waste disposal facilities. Previous experience includes over 12 years as Environmental Manager at BFI and Waste Management and 3 years with the Calhoun County Health Department as a solid waste inspector.

Dr. Te-Yang Soong, PhD, P.E. is available for questions regarding the technical details of the bioreactor process. Dr. Soong leads the research team at CTI which is responsible for the development and operation of the project. Dr. Soong has over 20 years of experience in innovative solid waste management design and engineering.

Regulatory Background

- Federal/Michigan law prohibits disposal of bulk liquids in landfills unless permitted as a Research Demonstration and Development Project (RDDP) under RCRA Subtitle D.

- 2005: Michigan amended Part 115, P.A 451, 1994, as amended to allow issuance of RDDP permits to landfills authorizing use of liquids to encourage biodegradation (commonly referred to as bioreactor landfill technology)

- Statute amendment (324.11511(b)) mirrors federal rule in that permits are valid for up to 12 years (annual reports and 3 year renewal required) and sites must comply with all other operational requirements including leachate control, monitoring, etc.
- Part 115 includes more stringent design and construction requirements than Federal Subtitle D rules.
    - Specifically, double composite liner systems are required for traditional landfill construction in Michigan unless a site meets criteria for natural soil barriers (Liner construction cost ~ **$102,000/acre**).
    - Michigan authorizes use of the single composite liner specified in Subtitle D where the site is located in an area with at least 10' of uninterrupted natural clay and can be effectively monitored using groundwater wells (Liner construction cost ~**$55,000/acre**).
- Michigan also added a requirement for a secondary liner with monitoring beneath the upper liner for RDDP's at sites which would otherwise be approved/permitted with single composite liner construction (Example RDDP Double Liner Construction Cost ~ **$84,000/acre**).
- Michigan included a requirement for adhering to County Planning limitations

Project Background and Research Outcomes

- **February, 2007:** Michigan Department of Environmental Quality (MDEQ) issued a RDDP permit to the Smiths Creek Landfill authorizing placement of septage in the landfill for the objectives of:
  ① Diverting septage from possible land application,
  ② Demonstrating that traditional design and controls are suitable for use with bioreactor landfill technology, and
  ③ Enhancing energy production potential by increasing gas production rates

- **Annual RDDP Reports** submitted to the MDEQ document the progress toward the goals, critical lessons learned and research outcomes for the first 3 years of operation.

- Since 2008, over 2.2 million gallons of septage have been injected into the 3.5 acre test area (approximately 600,000 gal/year)
- Leachate generated by the bioreactor is compatible with traditional liner systems and poses no physical harm to the integrity of single composite liner materials or design approved under Part 115
- Data shows a 7 fold increase in gas production rate (as compared with cells receiving no liquids) showing that even small landfills previously thought to produce too little gas to be viable as an alternative energy source can generate power

- **August, 2007:** EPA published a report[1] documenting outcomes of 5 full-scale sized bioreactor projects conducted under "Project XL" dating from 1998. The report documents that compliance with environmental control standards including leachate management, groundwater protection and gas management is achievable at a bioreactor landfill with traditional landfill design/construction concluding that:
  - All landfills studied maintained leachate measurements below 1' above the liner and adequate gas collection/control was achieved
  - Leakage did not occur below the primary liner in the studied landfills

- Both Federal and local research confirm that traditional landfill design affords effective environmental control for a bioreactor landfill. Continued progress toward the goal of full scale implementation requires a federal rule change authorizing full scale permitting.
  - In March, 2011 the EPA announced its intention to consider expanding RDDP permitting program authority and/or authorizing full-scale bioreactor permits. CTI / St. Clair County and the MDEQ have been included as industry stakeholders in the upcoming deliberation with the agency.
  - Approximating real-world performance is an important step toward full scale implementation and requires demonstration under a variety of conditions including pre-existing facilities.
    - Pre-existing sites offer untapped resources in that the waste mass may have the capacity to receive diverted septage or other liquid wastes

- Conversion of a pre-existing facility to a permitted bioreactor may allow sites to support gas-to-energy projects where not feasible without the accelerated gas production
- Some pre-existing cells are permitted and constructed with a single composite liner system. While deemed sufficiently protective for use in full scale landfilling applications, they are ineligible for a RDDP permit.

- Only sites already meeting the stringent criteria of a natural soil barrier are affected by the amendment, as sites not otherwise able of satisfy the criteria must be constructed with double composite liners under Part 115 requirements.

Impact of Proposed Bill

- Removes requirements from Part 115 demonstrated to be of negligible benefit while retaining the protection offered by extensive environmental monitoring and control measures that are equivalent to, and in many cases, more stringent than federal requirements.
  - Research demonstrates no significant differences between overall operations or leachate produced by a bioreactor landfill.
  - Existing regulation demonstrated to be equally effective in controlling risk at bioreactor landfill sites as at traditional landfills
  - Allows market forces to encourage development of bioreactor landfill research projects by removing unnecessary costs of double liner construction at sites otherwise approved for single liner design based on location, geology and other required environmental controls.

- Allows establishment of alternative disposal capacity at sites with permitted single composite liner design for septage and other approvable liquids (Example: Concentrated Animal Feeding Operations (CAFO) byproducts) to further divert volume from land application and protect water resources. The MDEQ retains the authority to approve any permit.

- Adds incentive to develop bioreactor landfills to optimize existing gas to energy capacity and infrastructure to maximize alternative energy production in a region already heavily invested in landfill gas to energy projects based on Department of Energy reports[2] (2011).

Regulatory Consensus

- CTI and St. Clair County have collaborated with the MDEQ on the proposed amendment and concur that single composite design, where otherwise allowed under Part 115, is effective in protecting groundwater and other resources based on environmental controls, monitoring and operational requirements already established in Part 115.

- The MDEQ Resource Management Division (RMD) further concurred in a meeting held on January 19, 2011 that quantifiable benefits of the RDDP program has the potential to produce quantifiable benefits based on the volume of septage already diverted from land application under the SCL RDDP permit.
    - An average of 57 million gallons of septage[3] has been land applied annually in Michigan between 2005-2009.
    - The 3.5 acre RDDP at SCL alone receives an average of 600,000 gal/year of septage. Across the state this technology offers a significant positive impact in the volume of septage currently land applied.
    - The MDEQ RMD has expressed an interest in maximizing use of the receiving capacity of the SCL receiving station.

- The MDEQ has supported efforts to further develop the bioreactor landfill technology to achieve additional water resources protection as well as encourage energy production in the state.
- The MDEQ has demonstrated a willingness to participate in the EPA process for revising Part 258 Subtitle D RDDP requirements to facilitate development of a greater number of bioreactor landfill projects.

Summary

House Bill 4875, 2011 encourages research and demonstration activities intended by Part 11511(b) of Part 115 without the unintended cost consequence of a double liner system which has been demonstrated to provide negligible protection beyond traditional liner design. The amendment facilitates potential diversion of septage from land application based on market forces. Finally, the bill will allow landfill facilities previously thought to generate insufficient gas the opportunity to contribute alternative energy to the grid to help meet renewable energy goals.

Attachments:

Figure 1: Schematic and Table of Relative Differences in Landfill Liner Design/Cost; CTI and Associates, Inc., 2011

Figure 2: Licensed Septage Haulers in Michigan, MDEQ RMD (http://www.michigan.gov/deq/0,1607,7-135-3313_3682_3717---,00.html)

Figure 3: Photos

1. Established Septage Receiving Facility, Smiths Creek Landfill
2. Documented Conditions Resulting from Improper Land Application of Septage (http://www.michigan.gov/deq/0,4561,7-135-3313_3682_3717-89957--,00.html)

Figure 4: Excerpts from Department of Energy (DOE) 2011 Report Reflecting Trends in Electricity Cost and Alternative Energy Composition[2]

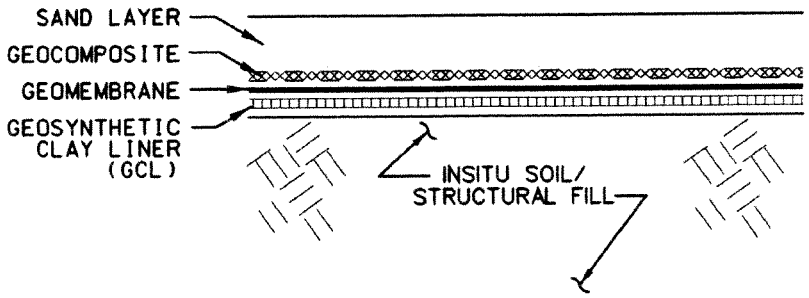
Cited Sources:

[1]Bioreactor Performance Summary Paper, U.S. EPA Office of Solid Waste, Municipal and Industrial Solid Waste Management Division, August 15, 2007 (EPA530-R-07-007)

[2]Excerpt, DOE US Energy Information Administration, Form EIA 923Power Plant Operations Report, 2010 (http://www.eia.gov/)

[3]MDEQ Septage Program Volume Reports, 2005 - 2008; Matthew Campbell, MDEQ RMD

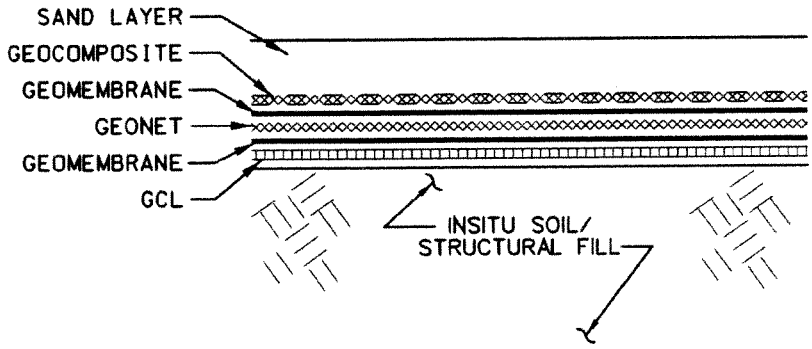
Figure 1: Relative Differences in Landfill Liner Design/Cost



($55,000 PER ACRE)

SINGLE COMPOSITE LINER SYSTEM

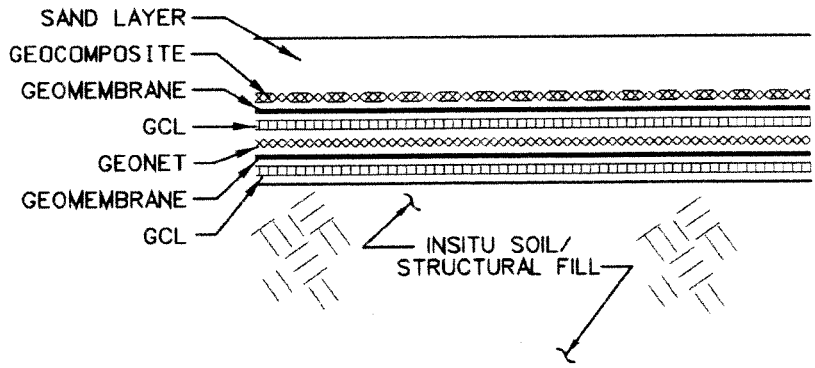
NOT TO SCALE



($84,000 PER ACRE)

DOUBLE LINED SYSTEM

NOT TO SCALE



($102,000 PER ACRE)

DOUBLE COMPOSITE LINER SYSTEM

NOT TO SCALE

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LANDFILL LINER SYSTEM

JUNE 2011

8.5x11 (in)

EXAMPLE LINER CONSTRUCTION COST COMPARISON

DOUBLE COMPOSITE LINER SYSTEM (No Natural Soil Barrier)

LAYER (from Top)		UNIT PRICE		AMOUNT PER ACRE	COST PER ACRE
Drainage sand layer		$ 1.40	per CY	1,613	$ 2,258.67
Geocomposite	Material	$ 0.30	per SF	43,558	$ 13,067.40
	Installation	$ 0.10	per SF	43,559	$ 4,355.90
Geomembrane	Material	$ 0.28	per SF	43,560	$ 12,196.80
	Installation	$ 0.14	per SF	43,560	$ 6,098.40
GCL	Material	$ 0.30	per SF	43,560	$ 13,068.00
	Installation	$ 0.12	per SF	43,560	$ 5,227.20
Geonet	Material	$ 0.16	per SF	43,560	$ 6,969.60
	Installation	$ 0.08	per SF	43,560	$ 3,484.80
Geomembrane	Material	$ 0.28	per SF	43,560	$ 12,196.80
	Installation	$ 0.14	per SF	43,560	$ 6,098.40
GCL	Material	$ 0.30	per SF	43,560	$ 13,068.00
	Installation	$ 0.10	per SF	43,560	$ 4,356.00
				TOTAL	**$ 102,446**

SINGLE COMPOSITE LINER SYSTEM (with Natural soil Barrier)

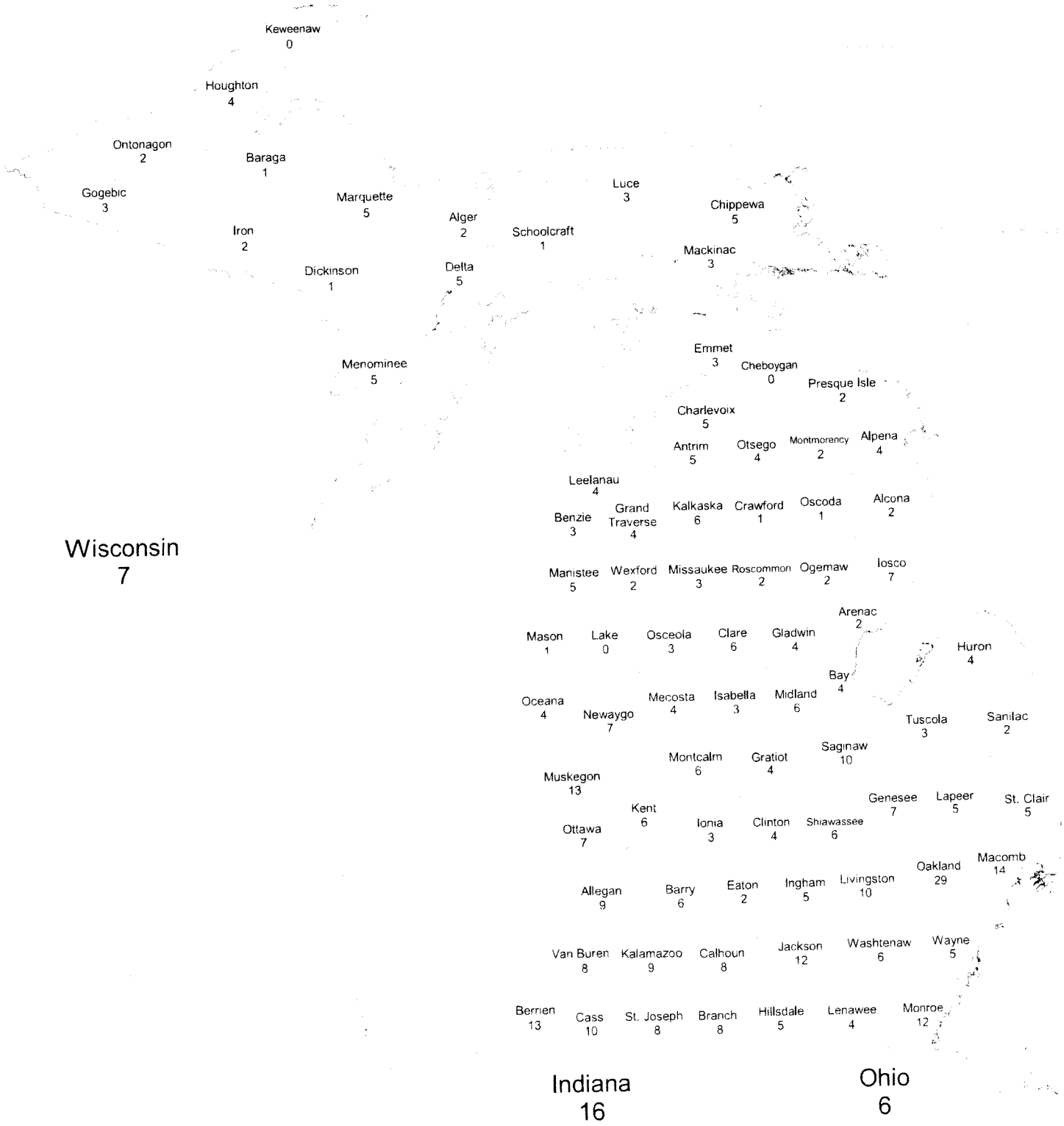
LAYER (from Top)		UNIT PRICE		ACRE	ACRE
Drainage sand layer		$ 1.40	per CY	1613	$ 2,258.67
Geocomposite	Material	$ 0.30	per SF	43558	$ 13,067.40
	Installation	$ 0.10	per SF	43559	$ 4,355.90
Geomembrane	Material	$ 0.28	per SF	43560	$ 12,196.80
	Installation	$ 0.14	per SF	43560	$ 6,098.40
GCL	Material	$ 0.30	per SF	43560	$ 13,068.00
	Installation	$ 0.10	per SF	43560	$ 4,356.00
				TOTAL	**$ 55,401**

DOUBLE LINED SYSTEM (with Natural Soil Barrier)

LAYER (from Top)		UNIT PRICE		AMOUNT PER ACRE	COST PER ACRE
Drainage sand layer		$ 1.40	per CY	1,613	$ 2,258.67
Geocomposite	Material	$ 0.30	per SF	43,558	$ 13,067.40
	Installation	$ 0.10	per SF	43,559	$ 4,355.90
Geomembrane	Material	$ 0.28	per SF	43,560	$ 12,196.80
	Installation	$ 0.14	per SF	43,560	$ 6,098.40
GCL	Material	$ 0.30	per SF		$ -
	Installation	$ 0.12	per SF		$ -
Geonet	Material	$ 0.16	per SF	43,560	$ 6,969.60
	Installation	$ 0.08	per SF	43,560	$ 3,484.80
Geomembrane	Material	$ 0.28	per SF	43,560	$ 12,196.80
	Installation	$ 0.14	per SF	43,560	$ 6,098.40
GCL	Material	$ 0.30	per SF	43,560	$ 13,068.00
	Installation	$ 0.10	per SF	43,560	$ 4,356.00
				TOTAL	**$ 84,151**

Figure 2

Number of Licensed Septage Haulers by County



December 2004

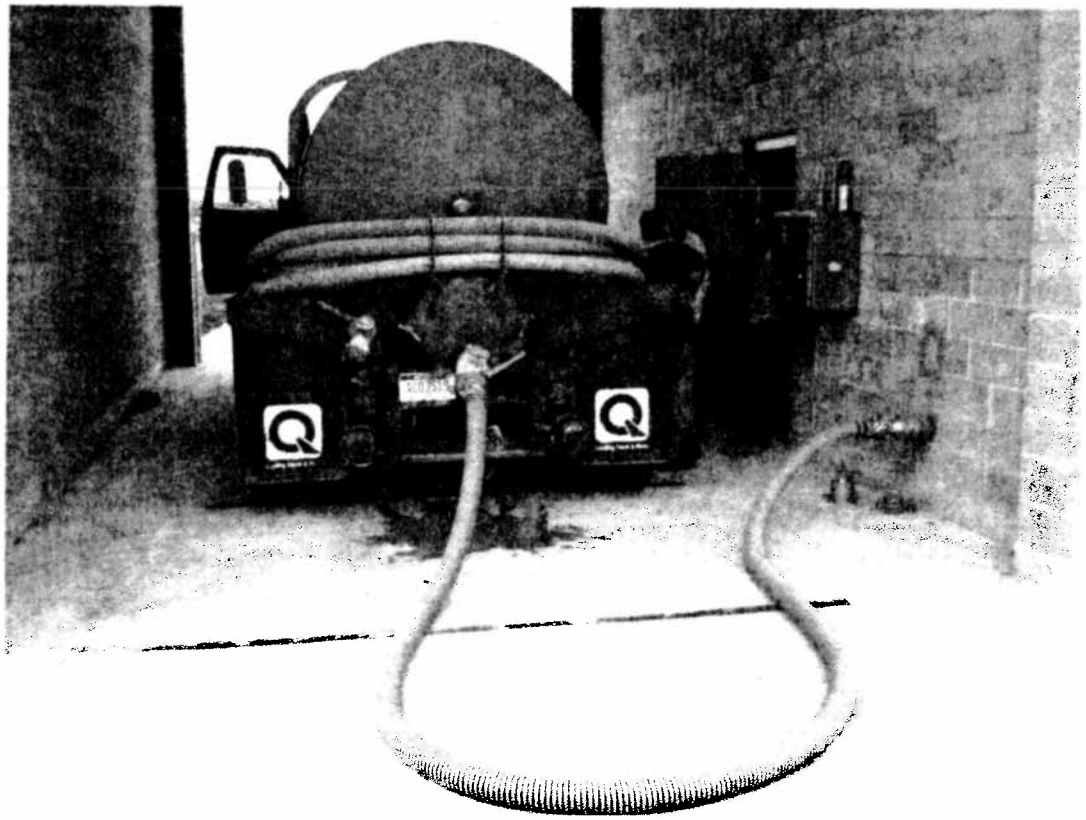
Photos of Documented Conditions Associated with Land Application of Septage

Source: Michigan Department of Environmental Quality

Figure 3: Photos

Smiths Creek Landfill Septage Receiving Station and Processing Unit

Source: St. Clair County, Smiths Creek Landfill



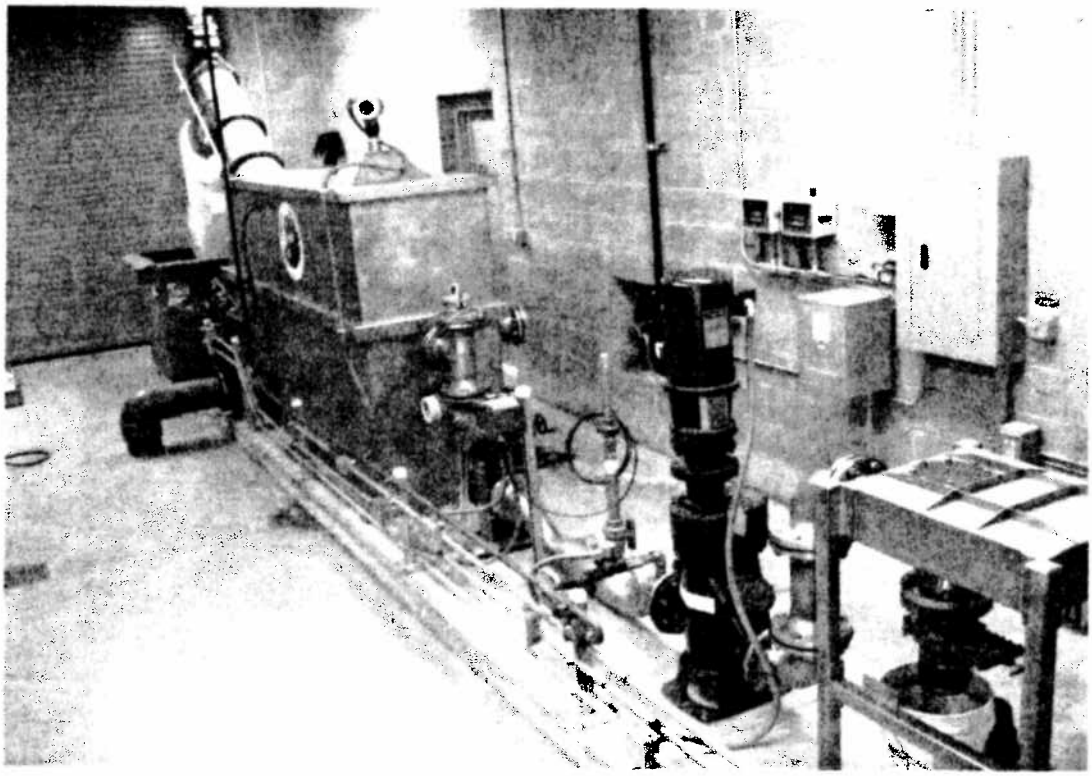


Figure 4: Excerpts from Department of Energy (DOE) 2011 Summary Report

Regional Importance of Landfill gas as a Renewable Energy Fuel

Based on DOE statistics published, August, 2010 (http://www.eia.doe.org), landfill gas is responsible for approximately 2% of the total energy generated by renewable fuels nationally. However, in the north central region, (Michigan, Ohio, Indiana, Illinois and Wisconsin) landfill gas is responsible for 17% of the renewable energy produced, making it a substantial and important contributor to the renewable fuels portfolio in this industrialized, cold weather region (Table 2)

Table 2: Excerpt from DOE (EIA) Annual Report; Alternative Electricity Generation by Source Fuel

Renewable Energy Trends in Consumption and Electricity 2008
Release Date: August 2010

Table 1.13 Renewable Electricity Net Generation by Energy Source and Census Div. 2008

Census Division	Biomass				Geothem.	Hydro	Solar	Wind	Total	% Contributed by Landfill Gas†
	Waste			Wood Derived Fuels						
	Landfill Gas	MSW Biogenic[1]	Other Biomass[2]							
Total	**7,156,340**	**8,096,801**	**2,480,617**	**37,299,853**	**14,951,348**	**254,831,385**	**864,315**	**55,363,100**	**381,043,759**	2%
New England	409,067	1,969,383	53,704	5,217,524	-	9,300,499	80	155,847	17,106,104	2%
Middle Atlantic	1,212,763	2,592,792	5,242	1,213,072	-	29,297,762	2,844	2,001,010	36,325,485	3%
East North Central	**2,143,973**	**221,243**	**26,657**	**2,904,192**	-	**3,942,284**	-	**3,218,758**	**12,457,107**	17%
West North Central	245,844	325,915	483,166	726,882	-	8,195,808	-	12,453,910	22,431,525	1%
South Atlantic	860,885	2,457,999	737,496	10,238,625	-	10,740,641	1,801	391,910	25,429,357	3%
East South Central	132,445	-	51,083	5,939,923	-	13,699,691	-	50,117	19,873,259	1%
West South Central	441,974	-	283,774	5,103,457	-	10,575,410	-	18,583,101	34,987,716	1%
Mountain	52,264	-1,163	59,574	642,434	1,834,015	32,253,554	189,091	6,650,682	41,680,450	0%
Pacific Contiguous	1,657,126	346,627	656,821	5,313,745	12,883,000	135,569,591	670,481	11,617,673	168,715,065	1%

[1]Includes paper and paper board, wood, food, leather, textiles and yard trimmings.
[2]Agriculture byproducts/crops, sludge waste, and other biomass solids, liquids and gases.
† calculation not included in EIA table; added by CTI and Associated based on EIA data
MSW = Municipal Solid Waste.
Source: U.S. Energy Information Administration, Form EIA-923, "Power Plant Operations Report."

Figure 4: Excerpts from Department of Energy (DOE) 2011 Summary Report

Electricity Cost

Nationally, the cost of electrical power to all sectors of end-users rose approximately 2% between November 2009 and November 2010 based on DOE data (http://www.eia.doe.org). Michigan experienced a 4% overall increase across all sectors of users, exceeding the national average.

Specific to Michigan, the DOE reports that prices to end-users rose approximately 18% in the manufacturing sector from November 2009 to Nov. 2010, further challenging efforts to attract much needed industry to the state (Table 3). As Michigan is expending great effort to re-establish industrial presence in the state, infrastructure issues such as cost of power will be drivers in the decision of industry to re-locate or expand operations in the region. While the DOE has not projected effects of additional alternative energy in the overall pricing outlook, conventional wisdom suggests that the addition of reliable alternative energy to the grid should increase supply and may decrease cost to the end-user.

Table 3: Excerpt from DOE (EIA) 2010 Report; Retail Price of Electricity to End-Users

Table 5.6.A. Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State, November 2010 and 2009

(Cents per Kilowatthour)

Census Division and State	Residential		Commercial[1]		Industrial[1]		Transportation[1]		All Sectors		Percent Change Industrial End User Cost†	
	Nov-10	Nov-09	Nov-10	Nov-09	Nov-10	Nov-09	Nov-10	Nov-09	Nov-10	Nov-09	$ Change	% Change
East North Central	**11.66**	**10.78R**	**9.41**	**8.86R**	**6.56**	**6.18R**	**6.68**	**8.00R**	**9.05**	**8.61R**	0.38	6%
Illinois	11.96	11.10R	8.61	8.12R	6.46	7.18R	6.43	7.83R	8.89	8.87R	-0.72	-10%
Indiana	10.31	9.15	9.18	7.9	6.37	5.55	9.56	9.37	8.19	7.19	0.82	15%
Michigan	12.17	11.58	9.77	9.76	7.1	6.04	11.59	10.34	9.71	9.31	1.06	18%
Ohio	11.44	10.61	9.83	9.54	6.4	6.21	7.93	9.81	9.04	8.67	0.19	3%
Wisconsin	12.76	11.55	9.9	9.24	6.8	6.43	--	--	9.68	9	0.37	6%
U.S. Total	**11.7**	**11.33R**	**10.07**	**9.85R**	**6.59**	**6.44R**	**10.42**	**11.13R**	**9.62**	**9.43R**	0.15	2%

[1] See Technical notes for additional information on the Commercial, Industrial, and Transportation sectors.

Source: U.S. Energy Information Administration, Form EIA-826, "Monthly Electric Sales and Revenue Report with State Distributions Report."

† Calculation not included in original EIA document; calculated by CTI and Associates, Inc. using EIA data